

## “Mars Sample Return, Updated to a Groundbreaking Approach”

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This paper provides an update to Mars Sample Return (MSR) studies presented at last year's conference.

During 2001, NASA issued contracts to four industry teams to conduct broad trade studies of what they envisioned to be the best implementation of MSR and subsequently tasked with focusing on a specific concept, fleshing-out a specific design concept. At last year's conference, six papers were presented on the results.

As new fiscal realities of a cost-capped Mars Exploration Program unfolded, it was evident that these MSR concepts did not fit reasonably within a balanced program. As a result, a MSR Science Steering Group (one of several Mars program science steering groups) was formed to reevaluate the science requirement on MSR and recommend an approach to a "first" MSR mission that might have a better change of fitting. After understanding what the cost drivers were on the original concepts, the science requirements were reduced to establish a floor-level (minimum acceptable science) mission.

Each industry team was asked to determine the least expensive implementation that could meet those requirements. They used their 2001 study concepts as a basis since time was short and we, in addition, needed to understand the differences between the original concepts and their new reduced mission concepts. Traceability of costs reduction was key to ensuring that they were rational and justifiable.

While the original mission concepts included comprehensive sample collection processes from a variety of locations, this floor-level mission uses an arm on a lander to scoop and sieve bulk samples at

a single site. Eliminated were 1) the need for a moderate-range rover with complex sample selection and handling, 2) individual sample packaging/cataloging capability, 3) subsurface drilling, and 4) the need to perform science investigation on the surface both before and after samples have embarked on their journey back to earth.

In this paper, the new concepts are described by each industry team and by JPL's Team-X (who provided an independent parallel concept development both in 2001 and this latest study), and the process of arriving at the results.

It is believed that the scope of this new "Groundbreaking" approach to MSR is well understood based on the studies and independent cost assessment by Aerospace Corporation and SAIC. It appears to be what a contemporary, balanced Mars Exploration Program can afford; has turned out to be justifiable by the MSR Science Steering Group and is in the process of, hopefully, being endorsed by the Mars science community at large.

A companion paper to be presented at this conference (Matousek as lead author) describes the Mars Exploration Program's latest plans for MSR early next decade, the independent cost assessment process that helped establish credibility of this low cost approach, technology development requirements, and interaction with other Mars missions.